

**WHAT IS CLAIMED IS:**

- ①. An integrated amplified telecoil system, comprising:
- 5 a telecoil for producing an electrical output signal in response to electromagnetic radiation;
- a first amplifier receiving said electrical output signal and having a first amplifier output producing a first amplified signal; and
- 10 a first filter having a selected pass band in an audio frequency range integrated into an integrated circuit with said first amplifier, said first filter coupled to said first amplifier output for receiving said first amplified signal and having a first filter output producing a first filtered signal.
2. The system of claim 1, further including a second amplifier integrated onto said integrated circuit with said first amplifier and said first filter, said second amplifier receiving said first filter signal and producing a second amplified output signal.
3. The system of claim 2, wherein said second amplifier is a signal processor.
4. The system of claim 1, further including a second filter on said integrated circuit and having a pass band different from said selected pass band of said first filter, said second filter receiving said first amplified signal and producing a second filtered signal.
5. The system of claim 4, further including a third amplifier for receiving said second filtered signal and producing a third amplified output signal.
6. The system of claim 5, wherein said third amplifier is realized as a signal processor.
7. The system of claim 1, wherein said telecoil is a center-tapped telecoil for producing two electrical output signals received by said first amplifier.

8.

A method of operating a listening device, comprising:  
converting electromagnetic radiation to electrical signals;  
amplifying said electrical signals to produce first amplified signals; and  
filtering said first amplified signals in an audio frequency range to produce first  
5 filtered signals, wherein said amplifying and said filtering are performed  
on a single integrated circuit.

9. The method of claim 8, further including amplifying, on said single integrated circuit, said first filtered signals.

10. The method of claim 9, wherein said amplifying said first filtered signals includes processing said first filtered signals.

11. The method of claim 8, further including filtering, on said single integrated circuit, said amplified signal with a pass band different from the pass band of said first filtering to produce second filtered signals.

12. The method of claim 11, further including amplifying, on said single integrated circuit, said second filtered signals.

13. The method of claim 12, wherein said amplifying said second filtered signals includes processing said second filtered signals.

14. The method of claim 8, wherein said converting is performed by a center-tapped telecoil.

15.

A telecoil system for a listening device, comprising:  
a telecoil for producing electrical output signals in response to being exposed  
to an electromagnetic field; and  
an integrated circuit receiving said electrical output signals, said integrated  
5 circuit including an amplifier providing amplified electrical output  
signals and a filter for passing selected signals from said amplified

electrical output signals, said selected signals being in a range from about 20 Hz to about 10 kHz.

16. The telecoil system of claim 15, wherein said telecoil is a center-tapped telecoil producing two electrical signals to be differentially processed by said integrated circuit.

17

A telecoil system for a listening device, comprising:

a telecoil for producing electrical output signals in response to being exposed to an electromagnetic field, said electrical output signals including an audio frequency signal and a non-audio frequency signal; and

5 an integrated circuit having an amplifier for amplifying said electrical output signal, a first filter for passing said audio frequency signal, and a second filter for passing said non-audio frequency signal.

18. The telecoil system of claim 17, wherein said electrical output signals further include a second non-audio frequency signal and said integrated circuit includes a third filter for passing said second non-audio frequency signal.

19. The telecoil system of claim 17, wherein said telecoil and said amplifier are coupled differentially.

20. The telecoil system of claim 17, wherein said telecoil and said amplifier are coupled in a single-ended fashion.

21. The telecoil system of claim 17, further including electrostatic discharge protection circuitry.

22. The telecoil system of claim 17, further including electromagnetic interference protection circuitry.

23. The telecoil system of claim 17, further including an analog-to-digital converter for providing a digital output of said audio frequency signal.

24. The telecoil system of claim 17, further including an analog-to-digital converter for providing a digital output of said non-audio frequency signal.

25. The telecoil system of claim 17, further including a microcontroller for processing said non-audio frequency signal, said microcontroller providing functions for the operation of said hearing aid in response to said non-audio frequency signal.

26. The telecoil system of claim 17, further including a capacitor connected in parallel with said telecoil for increasing the sensitivity of the telecoil to the non-audio frequency signal.

27. The telecoil system of claim 17, wherein said telecoil is a center-tapped telecoil producing two electrical signals to be differentially processed by said integrated circuit.

28. A hearing aid, comprising:  
a microphone for converting sound into a first electrical output;  
a telecoil for producing a second electrical output in response to being exposed to an electromagnetic field, said second electrical output including audio frequency signals and non-audio frequency signals; and  
an integrated circuit for filtering said audio frequency signals from said non-audio frequency signals.

29. The hearing aid of claim 28, wherein said non-audio frequency signals are for controlling said hearing aid.

30. The hearing aid of claim 28, wherein said non-audio frequency signals are for programming said hearing aid.

31. The hearing aid of claim 28, wherein said non-audio frequency signals are modulated audio signals.

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32. An integrated amplified telecoil system for use in a hearing aid, comprising:  
a telecoil which produces an electrical output signal in response to  
electromagnetic radiation;  
a first amplifier having an input coupled to said telecoil and a first amplifier  
output producing a first amplified signal;  
a first filter having a selected pass band in an audio frequency range and having  
an input coupled to said first amplifier output and a first filter output for  
producing a first filtered signal; and  
wherein said first amplifier and said first filter comprising microcircuits that are  
integratable in a hearing aid housing.

33. The system of claim 32, further including a second amplifier and having an input coupled to said first filter output and an output, and said second amplifier comprising a microcircuit that is integratable in said hearing aid housing.

34. The system of claim 33, wherein said second amplifier is realized as a generalized signal processor.

35. The system of claim 32, further including a second filter having a pass band different from the pass band of said first filter and having an input coupled to said first amplifier output and a second filter output for producing a second filtered signal, said second filter comprising a microcircuit that is integratable in said hearing aid housing.

36. The system of claim 35, further including a third amplifier having an input coupled to said second filter output and a third amplifier output, said third amplifier comprising a microcircuit that is integratable in said hearing aid housing.

37. The system of claim 36, wherein said third amplifier is realized as a generalized signal processor.

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38 A method of operating a hearing aid, comprising:  
converting electromagnetic radiation to electrical signals;  
amplifying said electrical signals to produce first amplified signals; and  
filtering said first amplified signals in an audio frequency range to produce first  
5 filtered signals, wherein said amplifying and said filtering are performed  
by microcircuits integrated in a hearing aid housing.

39. The method of claim 38, further including amplifying said first filtered signals,  
said amplifying being performed on a microcircuit integrated in said hearing aid  
housing.

40. The method of claim 39, wherein said amplifying said first filtered signals  
includes processing said first filtered signals.

41. The method of claim 38, further including filtering said amplified signal with a  
pass band different from the pass band of said first filtering to produce second filtered  
signals, said filtering being performed on a microcircuit integrated in said hearing aid  
housing.

42. The method of claim 41, further including amplifying said second filtered  
signals, said amplifying being performed on a microcircuit integrated in a hearing aid  
housing.

43. The method of claim 42, wherein said amplifying said second filtered signals  
includes processing said second filtered signals.

44 A method of operating a listening device, comprising:  
converting electromagnetic radiation to an analog electrical signal with a  
telecoil;  
receiving said analog electrical signal in an integrated circuit;  
5 amplifying, in said integrated circuit, said analog electrical signal to develop an  
amplified analog signal;

converting, in said integrated circuit, said amplified analog signal to a digital signal; and

10                    processing, in said integrated circuit, said digital signal into at least two digital outputs, one of said at least two digital outputs being an audio and frequency band output.

45.     The method of claim 44, wherein another of said at least two digital outputs is a control band frequency output, and further including operating said hearing aid in a certain manner corresponding to said control band frequency output.

46.     The method of claim 44, wherein said converting is by an analog-to-digital converter operating at a high rate to gather high-frequency signals.

47.     The method of claim 46, wherein said rate is about 1 MHz.

48.     A telecoil system for a listening device, comprising:  
a telecoil for producing electrical output signals in response to being exposed to an electromagnetic field, said electrical output signals including an audio frequency signal and a non-audio frequency signal; and  
5        a hybrid circuit including at least one integrated circuit placed on a common miniature device that fits within a hearing aid, said hybrid circuit having an amplifier for amplifying said electrical output signal and at least one filter for passing said audio frequency signal.